Clinical Observations

Necrotizing fasciitis of the male genitalia (Fournier's gangrene)

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Necrotizing fasciitis of the male genitalia was first described 100 years ago. Although the mortality of this condition has generally been high, the last few years have seen dramatic therapeutic improvements. This paper details the treatment of necrotizing fasciitis in two patients and describes a plan of management, which includes early diagnosis, vigorous antibiotic treatment and radical débridement of the necrotic tissues, that should improve the prognosis of the condition.

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La fasciite nécrosante des organes génitaux mâles fut décrite pour la première fois il y a 100 ans. Bien que la mortalité reliée à cette affection soit généralement élevée, des gains thérapeutiques spectaculaires ont été enregistrés au cours des dernières années. Cet article expose en détail le traitement de la fasciite nécrosante chez deux patients et décrit une marche à suivre, qui comprend un diagnostic précoce, un traitement antibiotique vigoureux et le débridement radical des tissus nécrotiques; ceci devrait se traduire par une amélioration du pronostic de cette maladie.

Necrotizing fasciitis of the male genitalia is rare but is potentially fatal if it is not diagnosed and treated early. Five cases of rapidly progressing gangrene of the scrotum were described 100 years ago by Fournier.[1] Although Fournier's gangrene is well recognized it is frequently diagnosed late, and appropriate management is poorly defined. Treatment must begin with early recognition of the pregangrenous state and immediate institution of antibiotic and surgical treatment. Nevertheless, some have advocated delayed or no surgical débridement,[2] and others feel that limited and prudent débridement followed by repeated excision of necrotic tissue offers the best opportunity to preserve the skin for subsequent secondary closure.[3] More recent

Table I—Characteristics and outcome of treatment* in patients with necrotizing fasciitis

Patient no.	Age (yr)	Associated conditions	Results of culture	Complications	Outcome
1	50	Hypertension, diabetes	*Streptococcus bovis*, *Klebsiella oxytoca*, anaerobic streptococci	Cardiac arrhythmia, congestive heart failure, diabetes, respiratory failure, nutrition	Complete recovery
2	52	Paraplegia, urethral stricture	β-hemolytic streptococci, *Proteus mirabilis*, *S. bovis*	Septicemia, penile gangrene	Recovery, but needed suprapubic cystotomy and penectomy
3	65	Diabetes, hypertension, congestive heart failure	*S. faecalis*, *S. viridans*	None	Complete recovery
4	82	Alcoholism, poor hygiene, obesity	Anaerobic streptococci, *P. mirabilis*	Septic shock, gastrointestinal hemorrhage, "shock lung"	Complete recovery
5	60	Minor scrotal trauma	*Staphylococcus aureus*, *Bacteroides fragilis*	None	Complete recovery
6	25	Ischiorectal abscess	*S. faecalis*, *Escherichia coli*, *B. fragilis*	Seizures, pulmonary edema	Complete recovery
7	66	Recent myocardial infarction, psoriasis of scrotum	*B. fragilis*, *B. melaninogenicus*, anaerobic streptococci, β-hemolytic streptococci, *Clostridium welchii*	Pulmonary edema, congestive heart failure, pneumonia	Recovery; died of unrelated causes
8	64	Recent orchidectomy	*Enterobacter cloacae*, *S. faecalis*, anaerobic streptococci	None	Complete recovery

*All patients were treated with aggressive resuscitative measures, combination antibiotic therapy and immediate radical débridement.

studies, however, support immediate, and if necessary repeated, radical débridement.[4-6] We report our experience with aggressive antibiotic therapy, life-supporting measures and early extensive radical excision of the necrotic tissue.

Patients

Over a 10-year period (September 1972 to September 1982) eight patients with Fournier's gangrene were admitted to hospitals affiliated with Queen's University, Kingston, Ont. We analysed the cases according to age, presentation, associated conditions, bacteriologic findings, treatment, postoperative course and outcome (Table I). All the patients were treated with aggressive resuscitative measures (restoration of normal blood pressure and urinary output, assisted ventilation, if necessary, and correction of metabolic disturbances), antibiotic therapy and immediate radical débridement, which included the removal of all tissue that appeared to be necrotic and nonviable, and careful management and monitoring in a surgical intensive care unit.

We describe two cases that illustrate the varied causes of necrotizing fasciitis, the protean manifestations of the gangrenous process and the need for close monitoring of the patient.

Patient 1

A 50-year-old man with hypertension and diabetes was admitted to hospital with bilateral scrotal swelling and pain that had developed suddenly 4 days earlier. There was no history of trauma to the scrotum. He had been treated initially by his physician with cloxacillin. However, a purulent bloody discharge had begun from a necrotic area in the scrotum.

At the time of examination in the emergency department the patient was febrile and hypotensive (blood pressure 80/50 mm Hg), and the scrotum was swollen and erythematous, with a gangrenous area (Fig. 1). Swelling and erythema extended to the inguinal region.

After immediate and aggressive resuscitative measures (correction of the circulatory problem with intravenously administered fluids and corticosteroids) and institution of combination antibiotic therapy with penicillin, gentamicin and clindamycin all the devitalized tissue was removed; the testicles were left exposed but intact. Incision and débridement were done to the left inguinal area. Extensive débridement was required along the inguinal and femoral canals and the lower abdominal wall.

Histologic examination of the tissues revealed necrosis, and cultures of the purulent discharge yielded *Streptococcus bovis*, anaerobic streptococci and *Klebsiella oxytoca*.

Immediately after surgery the patient was admitted to the surgical intensive care unit, where he was treated for respiratory failure, cardiac arrhythmias and congestive heart failure. Because the gangrenous process was extending along the abdominal wall towards the axilla, débridement was performed again 36 hours after the first operation. The patient received ventilatory support and total parenteral nutrition for 2 weeks. Although epithelialization was satisfactory, skin grafting of the groin was carried out 2 months later to facilitate healing.

At the time of discharge from hospital there was a small area of granulation tissue in the groin, but it healed spontaneously over the next few months.

Patient 2

A 52-year-old paraplegic man presented with an acute swelling of the right side of the scrotum and fever, chills, nausea and vomiting. At the time of examination in the emergency room he was febrile, and the right side of the scrotum was hot, erythematous and edematous.

The initial diagnosis was epididymo-orchitis, for which he received intravenous therapy with ampicillin. However, his condition deteriorated over the next 16 hours. Septicemia was diagnosed clinically, and the scrotum was becoming gangrenous. Immediately the necrotic area as well as the right side of the scrotum and the right testicle were excised. He was found to have a urethral stricture, and a suprapubic catheter was inserted.

Histologic examination revealed necrotizing fasciitis with a sharp demarcation at the tunica albuginea testis between the essentially normal testicular tissue and the necrotic tissue of the scrotum (Fig. 2). Cultures yielded β-hemolytic streptococci, *Proteus mirabilis* and *S. bovis*.

Postoperatively the patient was admitted to the surgical intensive care unit. Although his condition improved over the next 4 days, the gangrenous process extended into the deep tissues of the penis (Fig. 3), so penectomy was performed. Histologic examination of the penis showed necrosis extending into the spongy tissues of the corpus spongi-

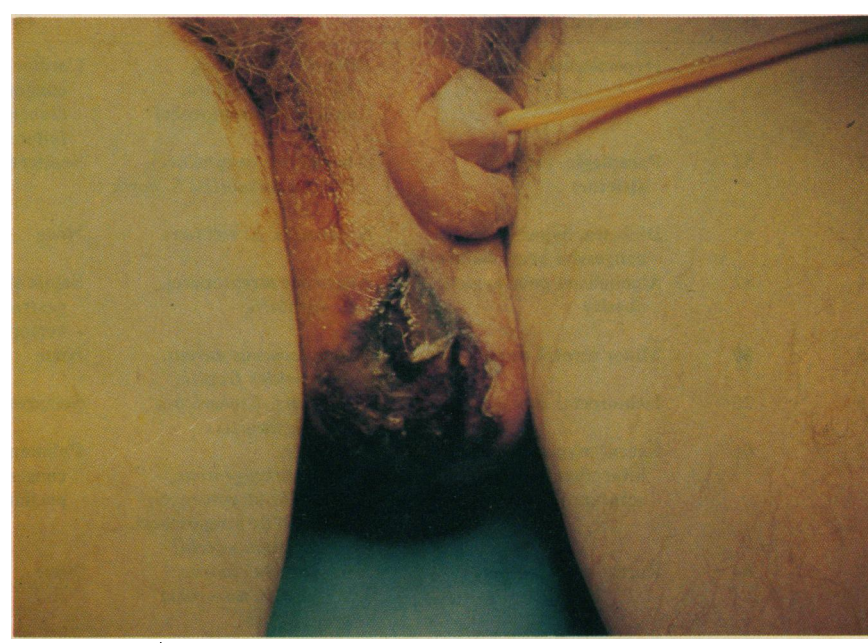

FIG. 1—Patient 1: Fournier's gangrene, with swelling and erythema in scrotum and early necrosis.

osum, both corpora cavernosa and the urethra.

One month later he underwent skin grafting of the perineal area, and he did well following discharge from hospital.

Discussion

Necrotizing fasciitis of the male genitalia, or Fournier's gangrene, usually occurs in men aged over 50 years, although it can occur at any age.[7] In our eight patients it was associated with debilitating conditions such as diabetes, alcoholism, ischemic heart disease and peripheral vascular disease, was preceded by local trauma, or was associated with underlying urinary tract diseases (urethral stricture) or perianal disease (perirectal abscess). In one of our patients (no. 8) necrotizing fasciitis developed following orchidectomy. It has also been reported to occur following such surgical procedures as herniorrhaphy, hydrocelectomy, hemorrhoidectomy,[2] prostatic biopsy[6] and vasectomy.[8] Another of our patients (no. 7) had extensive psoriasis of the scrotum; an injury to the skin may have created the route of entry for bacteria.

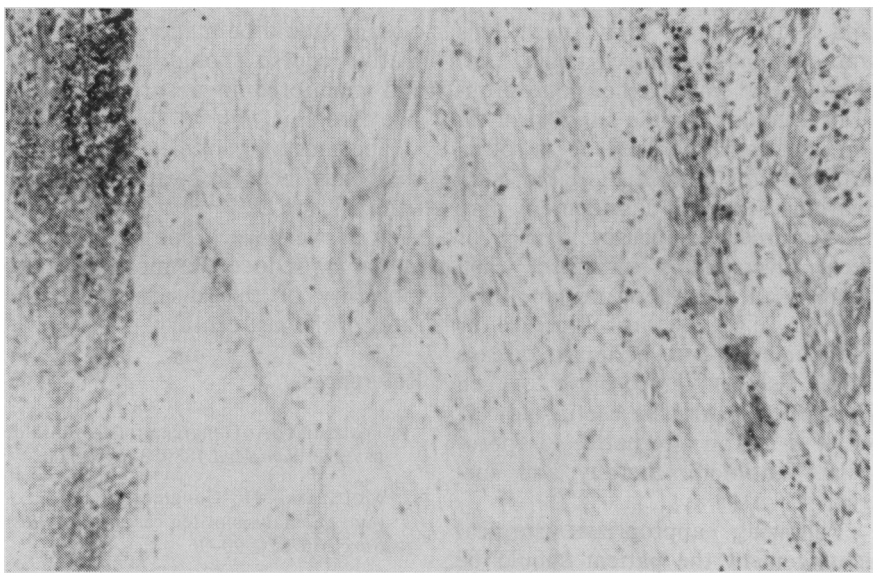

FIG. 2—Patient 2: sharp demarcation at tunica albuginea testis between essentially normal testicular tissue (right) and necrotic connective tissue and skin of scrotum. (Hematoxylin–eosin; magnification ×80).

FIG. 3—Patient 2: gangrene extending into deep tissue of penis.

Although gangrene may appear early and progress dramatically within a few hours, it more frequently has an insidious course. In most of our patients it started as pain in the scrotum and was rapidly followed, or preceded, by fever, swelling and redness that progressed to gangrene. Once gangrene is established in the scrotum, there is an explosive downhill course, with rapid extension of inflammation, subcutaneous emphysema and gangrene into the groin and along the abdominal wall (as in our patient 1). In our patient 2 the gangrenous process extended through all the layers of the penis, which resulted in a partial autopenectomy. Patients also experience septicemia with nausea, vomiting, prostration and shock, all of which result in death unless very vigorous and appropriate measures are taken.

The infecting organisms probably pass through Buck's fascia of the penis and spread along the dartos fascia of the scrotum and penis, Colles' fascia of the perineum and Scarpa's fascia of the abdominal wall.[4,9] All the previous reports of necrotizing fasciitis have emphasized the absence of involvement of the testis and spermatic cord structures; however, histologic verification of this observation was rarely provided.[7] Orchidectomy should be avoided, but we have occasionally performed immediate or delayed orchidectomy to facilitate healing and closure. In our patients histologic examination demonstrated that the testes were not involved in the necrotic process. Extension of the infection into the deep structures of the penis, as in patient 2, has not previously been reported. A penectomy should be avoided unless the gangrenous process is conclusively deemed irreversible and extensive. The initial treatment should be débridement of the skin of the penis, followed by grafting if necessary.

The organisms associated with necrotizing fasciitis are varied, and generally many strains are cultured, the most common being streptococci (including anaerobic), *Proteus*, *Klebsiella*, *Bacteroides* and *Escherichia coli*. It has been suggested that an interaction among several

organisms is usually necessary to cause the process.[10]

After appropriate specimens are taken for culture, wide-spectrum parenteral antibiotic therapy with agents effective against the most likely organisms must be instituted. We generally use combination therapy with penicillin, an aminoglycoside and an antibiotic effective against anaerobic bacteria, such as clindamycin or cefoxitin. We believe that antibiotic therapy, rapid resuscitation of the patient, and immediate and extensive débridement of all tissue that appears to be necrotic and nonviable are mandatory. This approach has produced rapid local and general improvement and probably accounts for the survival of all our patients. Because it is often difficult to delineate viable skin margins repeated débridement may be required. Temporary urinary or fecal diversion is indicated when there is an underlying urinary tract disease (e.g., urethral stricture or incontinence) or perianal disease (e.g., fistula). Hyperbaric oxygen therapy may also be useful; however, it is not an alternative to appropriate antibiotic therapy and surgery.

Following appropriate surgical management the patient should be cared for in a surgical intensive care unit since serious cardiopulmonary complications are common. Other long-term problems, such as nutritional support, must be considered during convalescence; total parenteral hyperalimentation or an oral elemental diet should be instituted if a long, complicated postoperative course is expected.

Although radical débridement often results in a substantial loss of skin on the penis, perineum, testes and abdomen, rapid epithelialization occurs after healthy granulation tissue has appeared. We found that the healing time was substantially decreased with the judicious use of split-thickness skin grafts.

On the basis of our experience, we propose the following plan of management for necrotizing fasciitis of the male genitalia. The physician must act promptly if the scrotum or the penile skin is inflamed and gangrenous changes appear. Combination antibiotic therapy with three agents must be instituted immediately and must be appropriate for all the etiologic agents possibly involved in the gangrenous process. The patient should undergo surgery as soon as possible, ideally after his condition has been stabilized. The surgical procedure should include excision of all necrotic tissue and other tegumental structures showing evidence of cellulitis or crepitation. The surgical field should be generously irrigated with distilled water following débridement. The incision should be packed open with gauze soaked with saline or povidine–iodine, and no attempt at primary closure should be made. The postoperative course should be managed and monitored in a surgical intensive care unit.

The mortality of necrotizing fasciitis has been reported to range from 13% to 22%.[3] A treatment plan such as we have proposed may significantly reduce the morbidity and mortality of this disease over the rates of the last century.

References

1. Fournier JA: Gangrène foudroyante de la verge. *Sem Med* 1883; 3: 345–348
2. Moustafa MF: Gangrene of the scrotum: an analysis of ten cases. *Br J Plast Surg* 1967; 20: 90–96
3. Jones RB, Hirschmann JV, Brown GS, Tremann JA: Fournier's syndrome: necrotizing subcutaneous infection of the male genitalia. *J Urol* 1979; 122: 279–282
4. Rudolph R, Soloway M, DePalma RG, Persky L: Fournier's syndrome: synergistic gangrene of the scrotum. *Am J Surg* 1975; 129: 591–596
5. Biswas M, Godec C, Ireland G, Cass A: Necrotizing infection of scrotum. *Urology* 1979; 14: 576–580
6. Ledingham IM, Tehrani MA: Diagnosis, clinical course and treatment of acute dermal gangrene. *Br J Surg* 1975; 62: 364–372
7. Alders N: Scrotal gangrene in a newborn baby. *Arch Dis Child* 1954; 29: 160–162
8. Pryor JP, Yates-Bell AJ, Packham DA: Scrotal gangrene after male sterilization. *Br Med J* 1971; 1: 272
9. Gray JA: Gangrene of the genitalia as seen in advanced periurethral extravasation with phlegmon. *J Urol* 1960; 84: 740–745
10. Giuliano A, Lewis F Jr, Hadley K, Blaisdell FW: Bacteriology of necrotizing fasciitis. *Am J Surg* 1977; 134: 52–57